INTI INTERNATIONAL UNIVERSITY

FOUNDATION PROGRAMME (ENGINEERING/SCIENCE) (CFSI)
STA1202: STATISTICS
FINAL EXAMINATION: MAY 2014 SESSION

Instructions: This paper consists of **SIX (6)** questions. Answer any **FIVE (5)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) There are 30 red marbles and 40 blue marbles in a box. Then k blue marbles are added to the box so that the probability of obtaining a blue marble from the box is $\frac{1}{2}$. Find the value of k.

(4 marks)

(b) **Table A** shows the waiting time for 40 passengers at a bus stop.

Table A

Time (minutes)	1− 4	5 − 8	9 − 12	13 − 16	17 − 20	21 − 24
Number of passengers	2	7	13	10	5	3

(i) Copy and complete **Table B**.

Table B

Class interval	Cumulative frequency	x $(x : midpoint)$	fx	fx^2
0.5− 4.5				
4.5 – 8.5				
8.5 – 12.5				
12.5 – 16.5				
16.5 – 20.5				
20.5 – 24.5				
			$\sum fx =$	$\sum fx^2 =$

(4 marks)

Find the

(ii) mean,

(1 mark)

(iii) variance,

(2 marks)

(iv) lower-quartile,

(2 marks)

(v) upper-quartile,

(2 marks)

(vi) inter-quartile range of the marks.

(1 mark)

(c) The number of taxis that arrive at a hotel in each period of five minutes is modeled by a Poisson distribution with mean 3.

(i) Find the probability that in a given five-minute period at least two taxis will arrive.

(2 marks)

(ii) Find the probability that in a given ten-minute period exactly two taxis will arrive.

(2 marks)

Question 2

(a) For each of the following variables, state whether it is a discrete or a continuous.

(i) The number of students in a class.

(1 mark)

(ii) The speed of a car passing a checkpoint on a motorway.

(1 mark)

(b) A factory produces metal spheres whose diameters are normally distributed with a mean of 10mm and a standard deviation of 0.1mm.

(i) If a metal sphere is chosen at random, find the probability that its diameter is less than 9.85mm.

(3 marks)

(ii) If five metal spheres are chosen at random, find the probability that their diameter is more than 50.5mm.

(4 marks)

(iii) If a factory produces 1000 metal sphere in a day, find the expected number of metal spheres that have diameters more than 10.15mm.

(4 marks)

(iv) Find the percentage of metal spheres that have diameters between 9.80 and 10.05mm.

(4 marks)

(v) If a sample of 10 metal spheres is chosen at random, find the probability that at least one metal spheres have diameters less than 9.85mm.

(3 marks)

Question 3

(a) The probability distribution function of a discrete random variable X is given as

x	1	2	3	4	5	6
$P(X=x)$	k	$4k$	$9k$	$9k$	$4k$	k

where k is a constant.

(i) Find the value of k.

(2 marks)

Find the value of the following.

(ii) $E(X)$.

(2 marks)

(iii) $E(X^2)$.

(2 marks)

(iv) $Var(X)$.

(2 marks)

(v) $Var(-2X+8)$.

(2 marks)

(b) A keep fit enthusiast swims, runs or cycles everyday with probabilities 0.3, 0.5 and 0.2 respectively. The probabilities that he spends time sauna after swimming, running or cycling are 0.3, 0.4 and 0.2 respectively.

(i) Represent the above information with a tree diagram.

(2 marks)

On any particular day, find the probability that he

(ii) has been cycling and has not been using the sauna,

(2 marks)

(iii) has been using the sauna,

(2 marks)

(iv) has been swimming given that he has been using the sauna,

(2 marks)

(v) has been running given that he has not been using the sauna.

(2 marks)

Question 4

(a) The time, T seconds, taken for the runners to run a 1000 meter race can be assumed to be normally distributed. 10% of the runners took less than 160 seconds and 20% took less than 165 seconds.
Find the mean and standard deviation of T.

(6 marks)

(b) A survey was conducted to find out whether or not there is an association between extraversion and selfishness in a sales department of a company. **Table C** shows the responses from the employees of the department.

Table C

	Selfish	Unselfish	Total
Extravert	23	x	51
Introvert	y	z	t
Total	57	43	

(i) In Table C, find the values of t, x, y and z.

(2 marks)

If an employee is selected at random from the department, find the probability that the employee

(ii) is introvert,

(1 mark)

(iii) is selfish and extravert,

(1 mark)

(iv) is unselfish given that the employee is extravert.

(2 marks)

(v) is introvert given that the employee is selfish.

(2 marks)

(vi) If two employees are selected at random from department, find the probability that only one of them is introvert.

(3 marks)

(vii) If an introvert and an extravert are selected at random from the department, find the probability that only one of them is unselfish.

(3 marks)

Question 5

(a) Ten cards numbered from 1 to 10 are placed in a box. Given that A represents the event that a prime number is picked and B represents the event that a number which is multiple of 4 is picked.

A card is picked at random from the box. Calculate the probability for the occurrence of

(i) event A,

(1 mark)

(ii) event B.

(1 mark)

State with reason whether event A and event B are

(iii) mutually exclusive,

(2 marks)

(iv) exhaustive.

(2 marks)

(b) A loaded die is such that when it is thrown the probabilities of obtaining a score of 6, a score 3 and a score of 2 are 0.12, 0.53 and 0.35 respectively.

In 20 independent throws of the die, find the probability that

(i) a score of 2 will be obtained at most two throws,

(3 marks)

(ii) a score of 2 will be obtained more than three throws,

(2 marks)

(iii) a score of 6 will be obtained more than one throws.

(2 marks)

(iv) Calculate the mean and variance of the number of throws to obtain a score of 6.

(2 marks)

(v) Find the number of throws that have to be made so that the probability of obtaining at least one throw to obtain a score of 3 is more than 0.95.

(5 marks)

Question 6

(a) If X and Y are independent variables where $E(X)=5$, $Var(X)=2$, $E(Y)=4$, and $Var(Y)=3$ find the values of the following.

(i) $E(2X+Y)$.

(2 marks)

(ii) $Var(2X-Y+1)$.

(2 marks)

(iii) $E(X-Y+1)$.

(2 marks)

(b) The table below shows the cumulative frequency distribution for the History marks obtained by 45 students in a trial examination.

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Marks	< 24.5	< 34.5	< 44.5	< 54.5	< 64.5	< 74.5	< 84.5
Cumulative frequency	0	3	9	21	34	40	45

(i) Using a scale of 2cm to represent 10 marks on the horizontal axis and 2cm to represent 10 students the vertical axis, draw an ogive to represent the data.

(5 marks)

(ii) Find the percentage of students who obtained less than 50 marks graphically.

(2 marks)

(iii) If a pie chart is drawn, find the angle of the sector which represents the number of students who obtained between 30 and 60 minutes.

(4 marks)

(iv) Find the percentage of students who obtained more than 60 marks graphically.

(3 marks)

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